TABLE 1
DATA NEEDS SUMMARY
USOR PROPERTY – AREA OF INTEREST 1

PRELIMINARY CONCEPTUAL SITE MODEL POTENTIAL EXPOSURE MEDIUM[1]	ITERATIVE DATA NEED	APPROACH TO FILL DATA NEED		
		EXISTING DATA REVIEWED	REMEDIAL INVESTIGATION ACTIVITY	REMEDIAL INVESTIGATION APPROACH AND DATA COLLECTION METHODS
On-Property Groundwater (and Off-Property Groundwater, if needed)	1) AOI-1-specific hydrogeology (hydraulic gradient, hydraulic conductivity, hydrostratigraphy, lithology, etc.). 2) Nature and extent of COPC concentrations. 3) General groundwater chemistry at AOI-1 (salinity, cations/anions, groundwater classification, etc.). 4) Uses of groundwater at and in the vicinity of AOI-1. 5) Discharge of groundwater to surface water. 6) Potential for groundwater to contribute to vapor intrusion and ambient air. 7) Potential presence of other groundwater plumes in the area.	1) Existing hydrogeology data for AOI-1. 2) Area water well survey (locations, use, depth, etc. of wells). 3) Historic groundwater concentration data. 4) Surrounding property groundwater quality data.	1) Evaluate AOI-1 hydrogeology. 2) Evaluate concentrations of COPCs in uppermost groundwater-bearing unit. 3) Perform more detailed water well and water use survey of area. 4) Perform a water well records search within one mile of AOI-1. Confirm that nearby properties are provided potable water from the local municipality. 5) Perform subsurface utility survey to identify obstructions for drilling program and preferential pathways for migration of COPCs. 6) Identify ongoing and/or historic spills/releases that have or have the potential to impact groundwater. 7) Evaluate potential for discharge of groundwater to	1) Perform initial high-resolution site characterization (HRSC) using a combination of assessment methods (e.g., cone penetrometer testing, depth-discrete groundwater sampling of the uppermost groundwater unit, and traditional soil borings). 2) Install permanent groundwater monitoring wells at pre-selected locations based on results of review of initial property characterization results. 3) Measure general groundwater parameters (temperature, specific conductance, pH, dissolved oxygen (DO). oxidation-reduction potential (ORP), TDS, etc.). 4) Collect groundwater samples to characterize on-property groundwater and evaluate potential impacts from source areas. Assess the potential for off-property migration and vertical migration on-property, if needed. Based on the results, refine the AOI-1 COPC list. 5) Conduct groundwater sampling events to assess seasonal variability e.g., quarterly for a year, evaluate, then determine appropriate monitoring program). 6) Perform hydraulic testing (slug testing) in selected wells. This data will be used with TDS data to establish groundwater classification. 7) Evaluate total versus dissolved concentrations of metals in groundwater samples. 8) Perform a water well records search to identify registered water wells located within one mile of AOI-1. In addition, perform a walking survey of immediately adjacent properties (500 feet from the property boundary) to identify the potential presence of un-registered water wells. 9) Assess the hydrogeologic connection and the potential for discharge of groundwater to Vince

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		EXISTING DATA REVIEWED	REMEDIAL INVESTIGATION ACTIVITY	REMEDIAL INVESTIGATION APPROACH AND DATA COLLECTION METHODS
			surface water. 8) Evaluate groundwater data to assess possibility of vapor intrusion (model).	Bayou through the evaluation of water levels and site stratigraphy, and the development of hydrogeologic cross-sections.
On- and Off[2]- Property Soil	1) Nature and extent of COPC concentrations in soil. 2) Potential source areas (e.g., bioreactors, tank farm, roll off boxes, former buried waste pit, etc.). 3) Surface water drainage patterns. 4) General soil characteristics to evaluate impact on COPC mobilization and sequestration in soil. 5) Background concentrations of COPCs in soil.	1) Concentrations of COPCs in soil collected during various investigations at AOI-1, and correlation of existing soil data with potential sources (including historical sources).	1) Evaluate lateral and vertical extent of COPCs in samples of surface soil (0 to 0.5 ft bgs), shallow soils (0.5 to 5 ft bgs) and subsurface soil (greater than 5 ft bgs). 2) Collect general soil chemistry data (pH, TOC, grain size, etc.). 3) Evaluate topography and preferential surface water drainage pathways. 4) Identify ongoing and/or historic spills releases that have or have the potential to impact soil.	1) Use detailed topographic survey of AOI-1 and adjacent and contiguous off-property areas (toward Vince Bayou) to identify drainage areas. 2) Advance soil borings to top of uppermost water-bearing unit to characterize surface and subsurface soil. 3) Collect discrete soil samples for laboratory analysis of COPCs. 4) Analyze selected representative samples for potential fate and transport parameters (total organic carbon, bulk density, etc.). 5) Evaluate property characteristics (e.g., presence and quality of vegetative cover, soil type, etc.) to qualitatively evaluate potential for erosion of soil. 6) Refine COPC list based on existing and newly-acquired data set. 7) Evaluate soil COPC concentrations relative to background COPC data.

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		EXISTING DATA REVIEWED	REMEDIAL INVESTIGATION ACTIVITY	REMEDIAL INVESTIGATION APPROACH AND DATA COLLECTION METHODS
On-Property Sediment (southeast areas of AOI-1 where surface water is present for the majority of the year)	1) Concentrations of COPCs in on-property sediment samples. 2) Nature of on-property sediment, i.e., is it beneath ponded rainwater or from other sources, is it ephemeral, etc.? 3) Adequacy of the habitat in the areas where sediment is present.	1) Source data (concentrations of COPCs, source type, etc.) 2) Historical information on releases from AOI-1. 3) Surface runoff patterns at AOI-1 to areas of standing water. 4) Concentrations of COPCs in on-property soil (no on-property sediment data are available).	1) Identify ongoing and/or historic spills/releases that have or have the potential to impact on-property sediment. 2) Collect sediment samples from areas of standing water on-property.	1) As appropriate based on the nature of the sediment at AOI-1, collect sediment samples for analysis of AOI-1 COPCs, TOC, grain size, etc. 2) Evaluate COPC data relative to PSVs for this exposure medium.
On-Property Surface Water (southeast areas of AOI-1 where surface water is present for the majority of the year)	1) Concentrations of COPCs in on-property surface water samples. 2) Nature of the on-property surface water; i.e., is it ponded rainwater or from other sources, is it ephemeral, etc.?	1) Source data (concentrations of COPCs, source type, etc.) 2) Historical information on releases from AOI-1. 3) Surface runoff patterns at AOI-1 to areas of standing water. 4) Nature and extent of COPCs in on-property soil.	1) Identify ongoing and/or historic spills/releases that have or have the potential to impact on-property surface water. 2) Collect data necessary to characterize surface water flow regime and origin of standing water.	1) Perform detailed topographic survey to indicate where standing water will collect on-property. 2) As appropriate based on the nature of the surface water, collect surface water samples from standing water for analysis of COPCs. For metals, analysis will be conducted for total and/or dissolved concentrations depending on the COPC (and as designated by eco benchmark table). 3) Evaluate COPC data relative to PSVs for this exposure medium.

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On-Property Air	1) COPC concentrations in on-property air (derived from COPCs concentrations in on-property soil).	1) Concentrations of COPCs in on-property soil collected during various investigations at AOI-1. 2) Review of existing ambient air monitoring data for area, if available.	1) Use on-property soil COPC concentration data to estimate and/or model potential emissions of volatile organic compounds and fugitive dust in on-property air.	1) Evaluate AOI-1 characteristics (e.g., presence and quality of vegetative cover, soil type, etc.). 2) Evaluate local meteorological data. 3) Estimate and/or model potential COPC concentrations in on-property air using on-property soil and groundwater COPC concentrations data and qualitative data described above.
Off-Property Air	1) COPC concentrations in off-property air (derived from COPCs concentrations in off-property soil)	1) Concentrations of COPCs in off-property soil collected during various investigations at the Property. 2) Review of existing ambient air monitoring data for property area, if available.	1) Use off-property soil COPC concentration data to estimate and/or model potential emissions of volatile organic compounds and fugitive dust in off-property air.	1) Evaluate off-property characteristics (e.g., presence and quality of vegetative cover, soil type, etc.). 2) Evaluate local meteorological data. 3) Estimate and/or model potential COPC concentrations in off-property air using off-property soil COPC concentrations data and qualitative data described above.

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Off-Property Surface Water [2]	1) Presence of surface water and associated uses. 2) Watershed sub-basin. 3) Commercial, industrial, and municipal activities located along Vince Bayou and Little Vince Bayou (up-stream of AOI-1), including the identification of permitted outfalls. 4) Documented "spills/releases" within the watershed sub-basin that had and/or continue to have the potential to impact surface water at AOI-1. 5) Surface water flow characteristics. 6) Background concentrations of COPCs in Vince Bayou and Little Vince Bayou surface water. 7) Concentrations of COPCs in surface water samples attributable to AOI-1 sources.	1) Source data (concentrations of COPCs, source type, etc.). 2) Historical information on releases from AOI-1 to soil and surface water. 3) Surface water drainage patterns at AOI-1 to off-property areas, extending to Vince Bayou and Little Vince Bayou. 4) Nature and extent of COPCs in on-property and off-property soil. 5) COPC concentration data from samples of surface water. 6) Surface water advisories and associated data.	1) Delineate the boundary and drainage within the watershed sub-basin. 2) Identify potential land use practices that might have impacted surface water adjacent to AOI-1. 3) Identify on-going and/or historic spills/releases that have or have the potential to impact surface water. 4) Collect data to characterize surface water flow regime (e.g., flow velocity, groundwater to surface water interactions, etc.). 5) Evaluate the surface water quality and the potential presence of COPCs in surface water.	1) Obtain information from the USGS and other local sources to define the extent and flow paths within the watershed sub-basin. 2) Perform an area reconnaissance to identify properties located within the watershed sub-basin that have the potential to impact the surface water system. After facility identification, obtain regulatory information from public sources to confirm facility operations. 3) Perform a regulatory database search to identify spills and/or releases that have occurred within the watershed that reached or had the potential to reach Vince Bayou or Little Vince Bayou. 4) Obtain publically available information on the physical flow properties of Vince Bayou and Little Vince Bayou (e.g., under normal and storm events). 5) Collect surface water samples in Vince Bayou and Little Vince Bayou for analysis of water quality parameters and COPCs. As part of this assessment, address total versus dissolved COPC concentrations, designed to address ecological benchmark criteria. 6) Evaluate Vince Bayou and Little Vince Bayou surface water sample COPC data relative to background COPC data for surface water samples collected in Little Vince Bayou as well as upstream in Vince Bayou.

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Off-Property Sediment [2]	1) Sediment and surface water hydrodynamics in Vince and Little Vince Bayou. 2) Background concentrations of COPCs in Vince Bayou and Little Vince Bayou sediment. 3) Concentrations of COPCs in sediment samples attributable to potential AOI-1 sources.	1) Source data (concentrations of COPCs, source type, etc.). 2) Historical information on releases from AOI-1. 3) Surface water drainage patterns from property extending to Vince Bayou and Little Vince Bayou. 4) Nature and extent of COPCs in on-property and off-property soil. 5) COPC concentration data from historic sediment samples.	1) Identify ongoing and/or historic spills/releases that have or have the potential to impact off-property sediment. 2) Collect data necessary to characterize sediment regime (sediment thickness, depositional patterns, TOC, grain size, etc.). 3) If necessary based on iterative approach to characterization, collect samples of sediment for analysis of AOI-1 COPCs.	1) Refine AOI-1 COPC list by evaluating source area, soil and groundwater sample data. 2) Collect sediment samples in Vince Bayou and Little Vince Bayou for analysis of AOI-1 COPCs, if warranted. 3) Evaluate potential for AOI-1 to contribute COPCs to sediment in Vince Bayou above background levels collected in Little Vince Bayou and upstream in Vince Bayou. 4) Evaluate general chemistry of sediment (pH, TOC, grain size, organic carbon, etc.) in all samples.

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Fish/Shellfish [2]	1) Identify fish/shellfish species present and affinity for Vince Bayou and Little Vince Bayou near AOI-1. 2) Concentrations of COPCs in fish/shellfish tissue attributable to AOI-1 sources. 3) Assess the potential for fish/shellfish consumption in the area.	1) Source data (concentrations of COPCs, source type, etc.). 2) Historical information on releases from AOI-1. 3) Surface runoff patterns at AOI-1 to off-property areas, including surface water. 4) Nature and extent of COPCs in on-property and off-property soil. 5) COPC concentration data from samples of surface water, sediment and fish/shellfish. 6) Fish/shellfish advisories and associated data. 7) Other data from trustees.	1) Identify ongoing and/or historic spills/releases that have or have the potential to impact fish/shellfish. 2) Collect data necessary to characterize aquatic conditions relative to fish in Vince Bayou and Little Vince Bayou (e.g., fish/shellfish species present, property fidelity, prey items, etc.). 3) If necessary based on iterative approach to characterization, collect fish/shellfish samples for analysis of AOI-1 COPCs.	1) Refine property COPC list by evaluating source area, soil and groundwater sample data. 2) Identify fish/shellfish species present and affinity for property. 3) Collect fish/shellfish samples in Vince Bayou and Little Vince Bayou for analysis of AOI-1 COPCs, if warranted. 4) Evaluate potential for AOI-1 to contribute COPCs to fish/shellfish tissue in Vince Bayou above background concentrations measured in fish from Little Vince Bayou and upstream in Vince Bayou.

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General Data Needs	1) Collect qualitative data needed to support risk assessments such as the presence of T&E species, land use in the vicinity, receptor survey and use restrictions at AOI-1. 2) Identify potential preferential subsurface migration pathways. 3) Identify vegetative cover. 4) Identify climate patterns. 5) Identify land use within the watershed sub-basin. 6) Assess the potential for flooding. 7) Identify historic property ownership and use. 8) Assess the presence and quality of ecological habitat. 9) Identify any restrictive covenants on-property			1) Contact TPWD to determine potential presence of T&E species in the vicinity. 2) Contact the City of Pasadena Engineering Department to obtain a map of all subsurface utilities in the vicinity of AOI-1. In addition, contact the pipeline companies that operate subsurface pipelines in on-property and adjacent properties. 3) Assess the erosion potential of soils, which could create off-property impacts, extending to Vince Bayou. 4) Understand precipitation, prevailing wind direction, and assess how these parameters could impact mobilization of COPCs. 5) Obtain a current aerial photograph and access information from the City of Pasadena to obtain zoning information to define land use. 6) Obtain floodplain maps from FEMA to delineate the 100-year floodplain. 7) Establish historic property ownership and use through obtaining a chain-of-title and historic documents, extending back to a date, prior to property development. 8) Perform a reconnaissance and use public data to identify ecological habitats. 9) Evaluate property record to identify any restrictive covenants on-property.

See table notes on following page.

TABLE 1
DATA NEEDS SUMMARY
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Notes:

1) Refer to Exposure Medium column on Figure 1 for human health receptors and on Figure 2 for ecological receptors.
2) Sampling of these media to be performed in conjunction with appropriate background sampling, if necessary.
3) Color coding per Figures 1 and 2, as follows:

Green – Primary media to be sampled during initial stage of RI/FS.
Blue – Second iteration media to be sampled based on primary media sample data.
Pink – Third iteration media to be sampled based on primary media and second iteration media sample data.
Yellow – For human health risk assessment, exposure medium concentration will be estimated using primary media sample concentrations.